Photocatalysis Technology Cristal

Morphological, Compositional, and Shape Control of Materials for Catalysis, Volume 177, the

latest in the Studies in Surface Science and Catalysis series, documents the fast-growing developments in the synthesis, characterization, and utilization of nanostructures for catalysis. The book provides essential

background on using well-defined materials for catalysis and presents exciting new paradigms in the preparation and application of catalytic materials, with an emphasis on how structure determines catalytic

properties. In addition, the book uniquely features discussions on the future of the field, with ample space for future directions detailed in each chapter. Presents the latest paradigms in the preparation and application

of catalytic materials Provides essential background on using well-defined materials for catalysis Features discussion of future directions at the end of each chapter

This book is a printed edition of

the Special Issue "Photocalytic Coatings for Air-Purifying, Self-Cleaning and Antimicrobial Properties" that was published in Coatings.

Over the past few decades, mankind has observed an

unprecedented and remarkable growth in industry, resulting in a more prosperous lifestyle for peoples of many countries. In developing countries, however, explosive industrial growth is just now beginning to raise the living

standards of the people. Most industries, especially in these developing countries, are still powered by the burning of fossil fuels; con- quently, a lack of clean energy resources has caused environmental pollution

on an unprecedented large and global scale. Toxic wastes have been relentlessly released into the air and water leading to serious and devastating environmental and health problems while endangering the

planet and life itself with the effects of global warming. To address these urgent environmental issues, new catalytic and photocatalytic processes as well as open-atmospheric systems are

presently being developed that can operate at room temperature while being totally clean and ef?cient and thus environmentally harmonious. Essential to technologies harnessing the abundant solar

energy that reaches the earth are the highly functional photocatalytic proce- es that can utilize not only UV light, but also visible light.
Doctoral Thesis / Dissertation from the year 2011 in the subject

Chemistry - Materials Chemistry, East China University of Science and Technology (-), language: English, abstract: Considerable effort has been made to design, fabricate, and manipulate nanostructured materials by

innovative approaches. The precise control of nanoscale structures will pave the way not only for elucidating unique size/shape dependent physicochemical properties but also for realizing new

applications in science and technology. Nanotechnology offers unprecedented opportunities for improving our daily lives and the environment in which we live. This thesis mainly describes recent progress

in the design, fabrication, and modification of nanostructured semiconductor materials for environmental applications. The scope of this thesis covers TiO2, Bi2O3 and BiOCl materials, focusing particularly on

TiO2-based nanostructures (e.g., pure, doped, coupled, mesoporous, hierarchically porous, and ordered mesoporous TiO2). Mesoporous titania is of particular interest since this class of materials

possesses well-defined porosity and large specific surface areas. For photocatalytic degradation of organics, these desirable properties are anticipated to improve the efficiency. So in the first part of work, I have

synthesized the mesoporous titania by using poly ethylene glycol as a template in dilute acetic acid aqueous solution by hydrothermal process and investigated the effect of PEG molecular weights and thermal

treatment on the resultant structure and photocatalytic activity. When the molecular weights of PEG vary from 600 to 20,000, the particle sizes of mesoporous-TiO_2 structure decrease from 15.1 to 13.3 nm

and mean pore sizes increase from 6.9-10.6 nm. The activities of these mesoporous-TiO2 photocatalysts prepared by using PEG are evaluated and compared with Degussa P-25 using chloro-phenol as a testing

compound. [...]
Asphalt Pavements
Photocatalytic Functional Materials for Environmental Remediation
Synthesis, characterization and applications of nanomaterials in

the field of photocatalysis
Current Developments in Photocatalysis and Photocatalytic Materials
Emerging Trends in TiO2 Photocatalysis and Applications
Homogeneous Photocatalysis

Metal Oxide-Based Photocatalysis: Fundamentals and Prospects for Application explains the principles and fundamentals of metal oxide-based photocatalysis and the requirements necessary for their use in photocatalysis. It also

discusses preparation methods for photocatalysis, and the advantages, disadvantages and achievements of the most important metal oxides (TiO2, ZnO, Fe2O3, Ta2O3, CuO, NiO, Cr2O3, RuO2, etc.). The book concludes with the most important

photocatalytic applications and an overview of the future. Applications are organized by potential needs and solutions, addressing such areas as water treatment, hydrogen production, air treatment, chemical synthesis, and applications in

medicine and construction. Provides coverage of applications, presenting needs and solutions Covers essential applications, such as water treatment, hydrogen production, air depollution, medical applications, and much

more Includes the characterization of the most important metal oxides used in heterogeneous photocatalysis

Handbook of Waterborne Coatings comprehensively reviews recent developments in the field of

waterborne coatings. Crucial aspects associated with coating research are presented, with close attention paid to the essential aspects that are necessary to understand the properties of novel materials and their use in coating

materials. The work introduces the reader to progress in the field, also outlining applications, methods and techniques of synthesis and characterization that are demonstrated throughout. In addition, insights into ongoing

research, current trends and challenges are previewed. Topics chosen ensure that new scholars or advanced learners will find the book an essential resource. Serves as a reference guide to recent developments in waterborne

coatings for industrialists, scientists and engineers involved in the field of coatings Presents coverage of the unique application methods for waterborne coatings and when those methods should be used Provides foundational information

on waterborne coatings and discusses current market trends that impact the field

Photocatalysis and related processes occupy a strategic position for the future of photochemistry. This volume

provides an introduction to basic concepts and explains how applications work at the molecular level.

Advanced Oxidation Processes (AOPs) rely on the efficient generation of reactive radical

species and are increasingly attractive options for water remediation from a wide variety of organic micropollutants of human health and/or environmental concern. Advanced Oxidation Processes for Water Treatment

covers the key advanced oxidation processes developed for chemical contaminant destruction in polluted water sources, some of which have been implemented successfully at water treatment plants around the world. The book is structured in

two sections; the first part is dedicated to the most relevant AOPs, whereas the topics covered in the second section include the photochemistry of chemical contaminants in the aquatic environment, advanced water

treatment for water reuse, implementation of advanced treatment processes for drinking water production at a state-of-the art water treatment plant in Europe, advanced treatment of municipal and industrial

wastewater, and green technologies for water remediation. The advanced oxidation processes discussed in the book cover the following aspects: - Process principles including the most recent scientific findings and

interpretation. - Classes of compounds suitable to AOP treatment and examples of reaction mechanisms. - Chemical and photochemical degradation kinetics and modelling. - Water quality impact on process performance and

practical considerations on process parameter selection criteria. - Process limitations and byproduct formation and strategies to mitigate any potential adverse effects on the treated water quality. - AOP equipment design and economics

considerations. - Research studies and outcomes. - Case studies relevant to process implementation to water treatment. - Commercial applications. - Future research needs. Advanced Oxidation Processes for Water Treatment

presents the most recent scientific and technological achievements in process understanding and implementation, and addresses to anyone interested in water remediation, including water industry professionals, consulting

engineers, regulators, academics, students. Editor: Mihaela I. Stefan - Trojan Technologies - Canada

Design of Water-splitting Photocatalysts by First Principles Computations

Synthesis and Characterization of

ZnO/Graphene Nanostructures for Electronics and Photocatalysis
Chemistry and Industry
Asphalt Paving Technology 2013
Fundamentals and Applications
Photocalytic Coatings for Air-Purifying, Self-Cleaning and

Antimicrobial Properties

Nanoscience technology is playing a vital role in multidisciplinary research due to its unique characteristics at nanoscale as compared to bulk materials. In view of such excellent properties, like

high surface area, semiconducting nature, and non-toxicity, nanotechnology has emerged as a promising means to curb pollution. Liquid and crystal nanomaterials aim for products and processes that are ecofriendly, economically

sustainable, safe, and energy-efficient. One of the most popular fields widely adopted is photocatalysis of nanomaterials that involves photo-conduction in efficient removal/degradation of noxious pollutants. This book

focuses on generation of liquid and crystal nanomaterials for environmental remediation. Research for the development of more efficient photocatalysts has experienced an almost exponential growth since its popularization in

early 1970’s. Despite the advantages of the widely used TiO2, the yield of the conversion of sun power into chemical energy that can be achieved with this material is limited prompting the research and development of a

number of structural, morphological and chemical modifications of TiO2 , as well as a number of novel photocatalysts with very different composition. Design of Advanced Photocatalytic Materials for Energy and Environmental Applications

provides a systematic account of the current understanding of the relationships between the physicochemical properties of the catalysts and photoactivity. The already long list of photocatalysts phases and their modifications is

increasing day by day. By approaching this field from a material sciences angle, an integrated view allows readers to consider the diversity of photocatalysts globally and in connection with other technologies.

Design of Advanced Photocatalytic Materials for Energy and Environmental Applications provides a valuable road-map, outlining the common principles lying behind the diversity of materials, but also delimiting the

imprecise border between the contrasted results and the most speculative studies. This broad approach makes it ideal for specialist but also for engineers, researchers and students in related fields.

This thesis focuses on the design of novel inorganic water-splitting photocatalysts for solar applications using first principles computations. Water-splitting photocatalysts are materials that can photo-catalyze the water-splitting reaction under

certain conditions. They provide an alternative way to capture and store the energy from the sun. Currently, the energy conversion efficiency of photocatalytic devices under solar illumination and in pure water (pH=7) is still far from the

commercialization target. The design of new photocatalysts with better potentials is the key to solve this problem. We have first developed a so-called three-step method to compute the relative position of a semiconductor's

conduction band (valence band) vs. the H2/H2O (O2/H2O) level in solution from first principles. The merits of the method have been highlighted, and the performance of the method has been tested and compared with the performance of

other methods. We conclude that the three-step method provides the desired accuracy for high throughput screening at an acceptable computational cost. We have designed a three-tier first principles high throughput

screening system to identify new water-splitting photocatalysts by examining the phase stability, band gap and band edge positions of the candidate compounds. We construct the screening system by integrating the three-step method

together with other previously developed methods in our group. We use the system to screen about 3000 different materials. Through the screening, most of the known water-splitting photocatalysts have been reproduced and, more

importantly, sixteen new promising candidates have been proposed. Properties of these new candidates have been analyzed and compared to those of the known photocatalysts. Some particularly promising ones are highlighted.

Ti3O3N2 is one of the identified candidates from the high throughput screening, and is particularly interesting as it has good phase stability, a low band gap and suitable band edge positions. In addition, it has the

same crystal structure as Ta3N5 , which is also a photocatalyst with a low band gap. This leads to our study on the Ta3N5:Ti3O3N2 solid solution as a water-splitting photocatalyst. Using first principles computations, we study the phase

stability, band gap and band edge positions of the solid solution. The results suggest that the Ta3N5:Ti3O3N2 solid solution may have a better potential than both its end members as a water-splitting photocatalyst.

Titanium Dioxide (TiO2) and its Applications introduces the main physico-chemical properties of TiO2 that form the basis of its applications in various fields. The book focuses on TiO2 applications, with contributions from experts from

a wide range of disciplines who address titanium dioxide's utilization in energy, consumer, materials and devices, and catalytic applications. Applications addressed include photocatalysis, catalysis, optics, electronics,

energy storage and production, ceramics, pigments, cosmetics, sensors, heat transfer, and more. This book is ideal for a wide readership in the disciplines of materials science, chemistry and engineering in academia and

industry. Includes a wide range of applications of titanium dioxide, both current and emerging, in the fields of energy, consumer applications, materials and devices Provides a brief overview of titanium dioxide and its properties

and techniques to design, deposit and study the material Discusses relevant properties, preparation methods, and other considerations in each applications-focused chapter

Metal Oxide-Based Photocatalysis

Canadian Journal of Physics
Molecular Technology, Volume 1
Nanostructured Photocatalysts
Introduction to Photocatalysis
Semiconductors for Photocatalysis
A comprehensive volume on photocatalytic functional materials for

environmental remediation As the need for removing large amounts of pollution and contamination in air, soil, and water grows, emerging technologies in the field of environmental remediation are of increasing importance. The use of photocatalysis—a green technology with enormous potential to resolve the issues

related to environmental pollution—breaks down toxic organic compounds to mineralized products such as carbon dioxide and water. Due to their high performance, ease of fabrication, long-term stability, and low manufacturing costs, photofunctional materials constructed from

nanocomposite materials hold great potential for environmental remediation. Photocatalytic Functional Materials for Environmental Remediation examines the development of high performance photofunctional materials for the treatment of environmental pollutants. This timely volume assembles and

reviews a broad range of ideas from leading experts in fields of chemistry, physics, nanotechnology, materials science, and engineering. Precise, up-to-date chapters cover both the fundamentals and applications of photocatalytic functional materials. Semiconductor-metal nanocomposites,

layered double hydroxides, metal-organic frameworks, polymer nanocomposites, and other photofunctional materials are examined in applications such as carbon dioxide reduction and organic pollutant degradation. Providing interdisciplinary focus to green technology materials for the treatment of environmental

pollutants, this important work: Provides comprehensive coverage of various photocatalytic materials for environmental remediation useful for researchers and developers Encompasses both fundamental concepts and applied technology in the field Focuses on novel design and application of photocatalytic

materials used for the removal of environmental contaminates and pollution Offers in-depth examination of highly topical green-technology solutions Presents an interdisciplinary approach to environmental remediation Photocatalytic Functional Materials for Environmental Remediation is a vital

resource for researchers, engineers, and graduate students in the multi-disciplinary areas of chemistry, physics, nanotechnology, environmental science, materials science, and engineering related to photocatalytic environmental remediation.

Increasing energy demands as well as the

depletion of traditional energy sources has led to the need for the development and improvement of energy conversion and storage technologies. Concerns regarding climate change and environmental awareness has also created increased support for renewable energy and clean technology research.

One technology of interest is the photocatalyst, which is a material that is able to use natural light irradiation to create electrical currents or drive useful chemical reactions. For this purpose, a strong photocatalytic material has the following properties: i) strong absorbance over a wide solar radiation

spectrum; ii) high surface area for adsorbance of target species; iii) high electron efficiency characteristics such as high conductivity, long charge-carrier lifetimes, and direct pathways for electron transport; and iv) good chemical stability. All of these requirements serve to maximize the efficiency and overall

output of the device, and are a means of overcoming the performance hurdle required for the commercialization of various energy conversion technologies. Unfortunately, current photocatalytic materials suffer from small absorbance windows and high recombination rates which greatly reduce the conversion

efficiency of the catalyst. Titanium dioxide (TiO2), the most well-known and widely used photocatalyst, can only absorb light within the ultraviolet (UV) range - which accounts for only a small fraction of the entire solar spectrum. For this reason, the majority of recent research has been directed toward

producing photocatalysts that are able to absorb light within the visible and infrared range in order to maximize the amount of light absorbed in the solar spectrum. Other research is also being conducted to increase electrical conductivity and charge-carrier separation to further increase conversion

efficiency. It is hoped that these two major problems surrounding photocatalysis can be solved by using novel functional nanomaterials. Nanomaterials can be synthesized using three main techniques: crystal structuring, doping, and heterostructuring. By controlling the

structure of the crystal, materials of different phase, morphology, and exposed crystal facets can be synthesized. These are important for controlling the electronic properties and surface reactivity of the photocatalyst. Doping is the act of introducing impurities into a material in order to modify its band

structure and create a red shift in light absorption. Lastly, heterostructuring is a method used to combine different photocatalysts or introduce co-catalysts in order to widen the range of absorption, encourage charge separation, or both. Many novel photocatalytic materials have been synthesized using these techniques.

However, the next-generation photocatalytic material has remained elusive due to the high cost of production and complexity of synthesis. This thesis proposes a novel photocatalytic material that can be used in photocatalyzed waste-water remediation. Graphene-wrapped hierarchical TiO2 nanoflowers (G-TiO2)

are synthesized using a facile synthesis method. TiO2 is a material of particular interest due to its chemical and photo-corrosion stability, high redox potential, strong electronic properties, and relative non-toxicity. Hierarchical structures are highly desired because they are able to achieve both high surface area and high

conductivities. Graphene hybridization is a popular method for creating composites with highly conductive networks and highly adsorptive surfaces. To the best of my knowledge, the hybridization of graphene on hierarchical TiO2 structures without pre-functionalization of TiO2 has not yet been demonstrated in literature.

Therefore, it is proposed that the use of such a material would greatly simplify the synthesis process and enhance the overall photocatalytic performance of TiO2 over that of commercial TiO2 photocatalysts. In the first study, hierarchical TiO2 nanoflowers are synthesized using a solvothermal

reaction. It is then shown that under UV irradiation, the hierarchical TiO2 material is able to outperform commercial TiO2 material in the photodegradation of methylene blue (MB). Further characterization shows that this improvement is explained by a higher electrical conductivity, and exists

in spite of having a lower specific surface area compared to the commercial material. In the second study, G-TiO2 is synthesized by mixing hierarchical TiO2 nanoflowers with graphene oxide (GO) and reducing GO in a hydrothermal reaction. Photocatalytic tests show that this hybridization further improves the

performance of the hierarchical TiO2. Further studies reveal that an optimal graphene loading of 5 wt% is desired in order to achieve the higher rate of MB decomposition, and greatly outperforms P25 in this task. Characterization shows that G-TiO2 composites have increased specific surface area and electrical

conductivity compared to the hierarchical TiO2 nanoflower. It is believed that this work will provide a simple and efficient avenue for synthesizing graphene-TiO2 composites with greatly improved photocatalytic activity. This work may also find use in other photocatalytic applications such as chemical

deconstruction and manufacturing, hydrogen production, solar cells, and solar enhanced fuel cells. Heterogeneous catalysis is a topic very studied in science. Its application in technologies of energy conversion, water purification, chemical synthesis, car catalytic converter and so on is studied.

Recently, the TiO2 material in anatase and rutile phases has been used extensively in photocatalytic systems; its band-gap is localized in visible and ultra-violet spectra, proportioning a good material for generation of chemical radicals. Nowadays, the density functional theory (DFT) is shown as a

great tool to simulate all types of materials and the possibilities to simulate bulk and surfaces of materials importance in last few decades. Recently, quantum periodic calculations based on DFT methods have been widely used to simulate materials and the main functionals applied are PBE, PBE0 and

B3LYP; they are important for doping and adsorption theoretical investigations and are present in various simulation programs, such as, Crystal, Wien, Vasp and others. This methodology has investigate the influence of dangling bonds, cationic and anionic doping, charge transfer, surface energy and more

quantum properties. Quantum chemistry tools, in particular, DFT methods, are key points to develop high quality research and technology once theoretical calculations are important to guide and understand the molecular design in photocatalysis.

Recent rapid development of electronics

and electro-optical devices demands affordable and reliable materials with enhanced performance. Forming nanocomposites of already well-known materials is one possible route towards novel functional materials with desirable synergistic enhanced properties. Incompatible chemical properties,

mismatched crystal structures and weak bonding interactions between the substances, however, often limit the number of possible nanocomposites. Moreover, using an inexpensive, facile, large-area and flexible fabrication technique is crucial to employ the new composites in industrially viable

applications. This thesis focuses on the synthesis and characterization of different zinc oxide/graphene (ZnO/GR) nanocomposites, well suited for optoelectronics and photocatalysis applications. Two different approaches of i) substrate-free random synthesis, and ii) template-assisted selective area synthesis

were studied in detail. In the first approach, ZnO nanoparticles/rods were grown on GR. The obtained nanocomposites were investigated for better GR dispersity, electrical conductivity and optical properties. Besides, by adding silver iodide to the nanocomposite, an enhanced plasmonic

solar-driven photocatalyst was synthesized and analyzed. In the second approach, arrays of single, vertically aligned ZnO nanorods were synthesized using a colloidal lithography-patterned sol-gel ZnO seed layer. Our demonstrated nanofabrication technique with simple, substrate independent, and large wafer-

scale area compatibility improved the alignment and surface density of ZnO nanorods over large selective growth areas. Eventually, we found a novel method to further enhance the vertical alignment of the ZnO nanorods by introducing a GR buffer layer between the Si substrate and the ZnO seed layer,

together with the mentioned patterning technique. The synthesized nanocomposites were analyzed using a large variety of experimental techniques including electron microscopy, photoelectron spectroscopy, x-ray diffraction, photoluminescence and cathodoluminescence spectroscopy for in-

depth studies of their morphology, chemical and optical properties. Our findings show that the designed ZnO/GR nanocomposites with vertically aligned ZnO nanorods of high crystalline quality, synthesized with the developed low-cost nanofabrication technique, can lead to novel devices offering higher

performance at a significantly lower fabrication cost.

Advanced Oxidation Processes for Water Treatment

Air Pollution Abstracts

Fundamentals and Prospects for Application

Solid State Chemistry and Photocatalysis

of Titanium Dioxide
Titanium Dioxide (TiO2) and its Applications
Sustainable Material Solutions for Solar Energy Technologies
Due to an ever-increasing demand for clean energy, a sharp increase in the

development of technologies that utilize solar energy has occurred. Currently, there are several important methods for harnessing solar energy in various stages of technological development, these include:

photovoltaics, photocatalysis, photo-electrochemistry, solar thermal, and photochemistry. A related and parallel consideration is sustainable aspects of materials usage including efficiency and

environmental friendliness of processing and production methods. In order to effectively utilize solar energy systems, an in-depth understanding of the technology as well as its suitability according to the

requirements and nature of usage is required. Sustainable Material Solutions for Solar Energy Technologies: Processing Techniques and Applications provides an overview of the challenges that must be

addressed to efficiently utilize solar energy. It looks at novel materials and device architectures that have been developed to optimize energy conversion efficiencies and minimize environmental impacts.

Advances in technologies for harnessing solar energy are extensively discussed, with topics including materials processing, device fabrication, sustainability of materials and manufacturing, and current

state-of-the-art. Leading international experts discuss the applications, challenges and future prospects of research in this increasingly vital field, providing a valuable resource for students and

all researchers working in this field.
During the past years, scientists have achieved significant success in the nanoscience and nanotechnology.
Nanotechnology is a field of

applied sciences which is focused on design, production, detection, and employing the nano-size materials, pieces, and equipment. Advances in nanotechnology lead to improvement of tools and

equipment as well as their application in everyday life. In the chemistry this size involves the range of colloids, micelles, polymer molecules, and structures such as very large molecules or dense accumulation of the

molecules. In physics of electrical engineering, the nanoscience is strongly related to quantum behaviour or electrons behaviour in structures with nano sizes. Also, in biology and biochemistry, there are

interesting cellular components and molecular structures. This book collects new developments about nanoparticles. Asphalt Pavements contains the proceedings of the International Conference on

Asphalt Pavements (Raleigh, North Carolina, USA, 1–5 June 2014), and discusses recent advances in theory and practice in asphalt materials and pavements. The contributions cover a wide range of topics:–

Environmental protection and socio-economic impacts- Additives and mo Photocatalytic materials can improve the efficiency and sustainability of processes and offer novel ways to address issues across a wide

range of fields—from sustainable chemistry and energy production to environmental remediation. Current Developments in Photocatalysis and Photocatalytic Materials provides an overview of the

latest advances in this field, offering insight into the chemistry and activity of the latest generation of photocatalytic materials. After an introduction to photocatalysis and photocatalytic materials,

this book goes on to outline a wide selection of photocatalytic materials, not only covering typical metal oxide photocatalysts such as TiO2 but also exploring newly developed organic semiconducting

photocatalysts, such as g-C3N4. Drawing on the experience of an expert team of contributors, Current Developments in Photocatalysis and Photocatalytic Materials highlights the new horizons

of photocatalysis, in which photocatalytic materials will come to play an important role in our day-to-day lives. Reviews developments in both organic- and inorganic-based materials for use in

photocatalysis Presents the fundamental chemistry and activity of a broad range of key photocatalytic materials, including both typical and novel materials Highlights the role photocatalytic materials can

play in sustainable applications
Physics, Chemistry and Biology
Photocatalysts for Organics Degradation
Surface Science of Photocatalysis

Quantum Chemistry Applied to Photocatalysis with TiO2
Environmentally Benign Photocatalysts
Morphology Genetic Materials Templated from Nature Species

Presenting the basic science of

semiconductor photocatalysis together with the various practical applications, this textbook is ideal for graduate students. It covers fundamental principles and applicable techniques of light, solid state physics, electrochemistry, reaction kinetics, and

materials processing. A solid understanding of semiconductor photoelectrochemistry is developed through discussing the basic properties of a representative photocatalytic material, TiO2; the basic science of the light absorption phenomenon and

the application to the powder suspension useful for the photocatalytic research; and the electronic state of semiconductors. Following this, the textbook moves on to explore photoelectrochemistry; the mechanism and kinetic analysis of

photocatalytic reactions; typical fabrication methods of common photocatalysts and the factors for improving photocatalytic activity; and evaluation methods of photocatalytic activity. The textbook concludes by looking at the future prospects of the

applications of photocatalysis. This introductory textbook provides a foundation in photocatalysis to supplement graduate courses in catalysis, environmental science, materials science and chemical engineering.

"This volume is a collection of the papers presented at the three nanotechnology related symposia held during the Materials Science and Technology 2011 conference (MS&T'11), October 16-20, 2011 in Columbus, Ohio"--P. vii.

Surface Science of Photocatalysis, Volume 32, summarizes significant findings on the surface science behind various classic and novel photocatalysts for energy and environmental applications, with special emphasis on important

surface/interface processes in photocatalysis, such as interfacial charge transfer, function of co-catalysts, and adsorption over photocatalyst surface. This book timely and systematically reviews the state-of-the-art of the surface science

in semiconductor-based photocatalysis, serving as a useful reference book for both new and experienced researchers in this field.

Ceramic Transactions, Volume 264, Proceedings of the 12th Pacific Rim Conference on Ceramic and Glass

Technology Dileep Singh, Manabu Fukushima, Young-Wook Kim, Kiyoshi Shimamura, Nobuhito Imanaka, Tatsuki Ohji, Jake Amoroso, and Michael Lanagan; Editors This proceedings contains a collection of 32 papers presented at the

12th Pacific Rim Conference on Ceramic and Glass Technology (PacRim12), May 21-26, 2017 in Waikoloa, Hawaii. PacRim is a bi-annual conference held in collaboration with the ceramic societies of the Pacific Rim countries -

The American Ceramic Society, The Chinese Ceramic Society, The Korean Ceramic Society, and the Australian Ceramic Society. Topics included in this collection include multiscale modeling and simulation, processing and manufacturing, nanotechnology,

multifunctional materials, ceramics for energy and the environment, biomedical materials, and more Proceedings of the 12th Pacific Rim Conference on Ceramic and Glass Technology; Ceramic Transactions Volume 82, Journal of the Association

of Asphalt Paving Technologists
Morphological, Compositional, and Shape Control of Materials for Catalysis
Advances in Synthesis, Processing, and Applications of Nanostructures
Liquid and Crystal Nanomaterials for

Water Pollutants Remediation

Photocatalysis has long been touted as a potential drinking water treatment technology but has proven difficult to implement at full scale.

This project aimed to address two of the perennial challenges preventing the use of photocatalysis for drinking water treatment: the need to

safely remove the photocatalyst from the water after treatment and the danger that incomplete mineralization of contaminants will lead

to the formation of intermediate compounds that are more reactive or toxic than their parent compounds. A suite of titanium dioxide-based linear

engineered nanomaterials (LENs) was synthesized and compared to standard commercial titanium dioxide nanoparticles in terms of filterability, settleability, surface

characteristics, crystal phase structure, available surface area, photonic efficiency, and propensity to form hydroxyl radicals. The LENs were also evaluated

in terms of their ability to remove disinfection byproduct (DBP) precursors from two natural surface water matrices via adsorption and

photocatalysis. DBPs, which form when naturally occurring organic precursor compounds interact with chemical disinfectants used in drinking water

treatment, are suspected carcinogens and are widely regulated throughout the world. In this study, photocatalysis increased the DBP formation

potential of both water matrices at short irradiation times. Longer treatment times resulted in decreased in DBP formation potential. Adsorption removed DBP

precursors from the water without transforming them. The surface area and crystal phase structure of the nanomaterials were identified as important

drivers of photocatalytic treatment effectiveness and regenerability. Adsorption efficacy was mainly impacted by surface area,

agglomeration, and charge interactions. The effects of both adsorption and photocatalysis on DBP formation potential were strongly influenced by

the composition of the water matrix being treated. The results of this project have informed the conceptual design of two titanium dioxide-based water

treatment processes for DBP precursor removal: a single step photocatalytic system and a two-step adsorption and regeneration system.

Edited by foremost leaders in chemical research together with a number of distinguished international authors, this first of four volumes summarizes the

most important and promising recent chemical developments in energy science all in one book. Interdisciplinary and application-oriented,

this ready reference focuses on chemical methods that deliver practical solutions for energy problems, covering new developments in advanced

materials for energy conversion, semiconductors and much more besides. Of great interest to chemists as well as researchers in the fields of energy

science in academia and industry.
Semiconductors for Photocatalysis, Volume 97 covers the latest breakthrough research and exciting

developments in semiconductor photocatalysts and electrodes for water splitting and CO2 reduction. It includes a broad range of materials

such as metal-oxides, metal-nitrides, silicon, III-V semiconductors, and the emerging layered compounds. New to this volume are chapters covering the

Fundamentals of Semiconductor Photoelectrodes, Charge Carrier Dynamics in Metal Oxide Photoelectrodes for Water Oxidation,

Photophysics and Photochemistry at the Semiconductor/Electrolyte Interface for Solar Water Splitting, V Semiconductor Photoelectrodes, III-

Nitride Semiconductor Photoelectrodes, and Rare Earth Containing Materials for Photoelectrochemical Water Splitting Applications. In

addition, the design and modeling of photocatalysts and photoelectrodes and the fundamental mechanisms of water splitting and CO2 reduction is also

discussed. Features the latest breakthroughs and research and development in semiconductor photocatalysis, solar fuels, and artificial photosynthesis Covers a

broad range of topics, including a wide variety of materials and many important aspects of solar fuels Includes in-depth discussions on materials design, growth

and synthesis, engineering, characterization, and photoelectrochemical studies

While books on semiconductor TiO2

photocatalysis are legion, nanostructured controlled photocatalysts are attractive beyond standard semiconductors, and this book is devoted

to the many novel uses of advanced TiO2 and MOF-based photocatalysts. Details on synthesis, characterization, and reaction applications of nanostructured

photocatalysts are summarized. Other new materials discussed in this book are Bi- W- oxides, metal complexes, and unique porous materials. This book

contains methods of preparation and characterization of unique nanostructured photocatalysts, and details about their catalytic action.

Contributors to this volume are leading Asian researchers in Photocatalysis. It will appeal to researchers wishing to know how to design new types of

photocatalysts with controlled nanostructures. Advanced Functional Materials Chalcogenide-Based Nanomaterials as

Photocatalysts

Nanoparticles Technology

Handbook of Waterborne Coatings

Applications of Titanium Oxide-based Materials

Advanced Energy

Materials

Chalcogenide-Based Nanomaterials as Photocatalysts deals with the different types of chalcogenide-based photocatalytic reactions, covering the fundamental concepts of photocatalytic reactions involving chalcogenides for a range

of energy and environmental applications. Sections focus on nanostructure control, synthesis methods, activity enhancement strategies, environmental applications, and perspectives of chalcogenide-based nanomaterials. The book offers guidelines for

designing new chalcogenide-based nanoscale photocatalysts at low cost and high efficiency for efficient utilization of solar energy in the areas of energy production and environment remediation. Provides information on the development of novel chalcogenide-based

nanomaterials Outlines the fundamentals of chalcogenides-based photocatalysis Includes techniques for heterogeneous catalysis based on chalcogenide-based nanomaterials Nanostructured Materials for Visible Light Photocatalysis describes the

various methods of synthesizing different classes of nanostructured materials that are used as photocatalysts for the degradation of organic hazardous dyes under visible light irradiation. The first three chapters include a general introduction, basic principles,

mechanisms, and synthesis methods of nanomaterials for visible light photocatalysis. Recent advances in carbon, bismuth series, transition metal oxide and chalcogenides-based nanostructured materials for visible light photocatalysis are discussed.

Later chapters describe the role of phosphides, nitrides, and rare earth-based nanostructured-based materials in visible light photocatalysis, as well as the characteristics, synthesis, and fabrication of photocatalysts. The role of doping, composites, defects,

different facets, morphology of nanostructured materials and green technology for efficient dye removal under visible-light irradiation are also explored. Other topics covered include large-scale production of nanostructured materials, the challenges in present

photocatalytic research, the future scope of nanostructured materials regarding environmental hazard remediation under visible light, and solar light harvesting. This book is a valuable reference to researchers and enables them to learn more about designing advanced

nanostructured materials for wastewater treatment and visible-light irradiation. Covers all the recent developments of nanostructured photocatalytic materials Provides a clear overview of the mechanism of visible light photocatalysis and the controlled

synthesis of nanostructured materials Assesses the major challenges of creating visible light photocatalysis systems at the nanoscale

The quality of water is not only a technological and scientific issue, but a social and economic problem,

in both developed and developing countries. Besides local regulations, which differ between regions and need constant upgrades, significant scientific developments are required in both the detection and removal of water contaminants. This Issue focuses

on some recent advancements in the photocatalytic removal of organic pollutants, which is one of the aspects of the problem that involves the need of advanced catalysts and implies significant advancements in the field of materials science and chemical

engineering.
Morphology Genetic Materials
Templated from Nature Species provides a comprehensive and up-to-date coverage of research on bio-inspired functional materials including materials science and engineering aspects of the

fabrication, properties, and applications. The book discusses bio-inspired strategies integrating biotemplate, biomineralization, and biomimesis in nature, which are adopted to fabricate functional materials with hierarchical bio-architectures and interrelated

outstanding performances, as well as valuable applications in photoelectricity, photonics, photocatalysis, chemical detection, bio-imaging, and photoelectron transfer components/devices. The book is intended for researchers and graduate students in the fields

of materials science, chemistry, nanotechnology, semiconductor, biotechnology, environmental engineering, etc. Prof. Dr. Di Zhang is currently a professor at the School of Materials Science and Engineering, Shanghai Jiao Tong University, and the director of the

State Key Laboratory of Metal Matrix Composites, China.

Nanostructured Materials for Visible Light Photocatalysis

Graphene-wrapped Hierarchical TiO2 Nanoflower Composites with Enhanced Photocatalytic Performance

Development and Evaluation of Photocatalytic Linear Engineered Titanium Dioxide Nanomaterials for the Removal of Disinfection Byproduct Precursors from Drinking Water
Energy Innovation
Drinking Water

Design of Advanced Photocatalytic Materials for Energy and Environmental Applications

New developments in mixing, testing, modeling Research findings on sustainable asphalt technology Bitumen use and

specifications in Europe Fully-searchable text on accompanying CD-ROM Asphalt Paving Technology 2013, a series volume, contains 26 original research papers devoted to the formulation, chemistry, mixing, modeling,

testing and optimization of asphalt—with applications to highway and infrastructure engineering. Written by leading civil and structural engineers from universities and government agencies around the world, the

book offers information for designing and producing higher-quality asphalt. Selected keywords: photocatalytic asphalt; fatigue loading; skid-resistance; low-temperature cracking software; long-term aging;

fracture properties; moisture damage; RAP; rejuvenators; binders; flexible pavement; healing. The CD-ROM displays figures and illustrations in articles in full color along with a title screen and main menu screen.

Each user can link to all papers from the Table of Contents and Author Index and also link to papers and front matter by using the global bookmarks which allow navigation of the entire CD-ROM from every article. Search

features on the CD-ROM can be by full text including all key words, article title, author name, and session title. The CD-ROM has Autorun feature for Windows 2000 with Service Pack 4 or higher products along with the program

for Adobe Acrobat Reader with Search 11.0. One year of technical support is included with your purchase of this product.
The semiconductor titanium dioxide (TiO2) has been evolved as a prototypical material to

understand the photocatalytic process, and has been demonstrated for various photocatalytic applications such as pollutants degradation, water splitting, heavy metal reduction, CO2 conversion, N2 fixation,

bacterial disinfection, etc. Rigorous photocatalytic studies on TiO2 have paved the way to understanding the various chemical processes involved and the physical parameters (optical and electrical) required to design

and construct diverse photocatalytic systems. Accordingly, it has been realized that an effective photocatalyst should have ideal band edge potential, narrow band gap energy, reduced charge

recombination, enhanced charge separation, improved interfacial charge transfer, surface-rich catalytic sites, etc. As a result, many strategies have been developed to design a variety of photocatalytic systems, which

include doping, composite formation, sensitization, co-catalyst loading, etc. Towards highlighting the above-mentioned diversities in TiO2 photocatalysis, there have been many interesting original research works on TiO2,

involving material designs for various photocatalytic applications published in this Special Issue. In addition, some excellent review papers have also been published in this Special Issue, focusing on the various

TiO2-based photocatalytic systems and their mechanisms and applications.
This book takes a broad and eclectic view of the water that all humanity depends upon, probing its role in human life and in the

history of our planet, as well as surveying the latest scientific understanding of purification techniques and standards for the protection of water quality. The volume opens with a chapter on the role of drinking water in

human life, which discusses the planet's water resources, the quality of drinking water, water and health, the advent of water quality standards, "Green" chemistry and more. The chapter concludes by discussing the

relationship of the biosphere and human civilization. Chapter Two explores the unique properties of water, the role of water in the scenario of development on Earth. Also covered is the current understanding of the importance

of the isotopic composition of water, in particular the ratio of protium to deuterium, which is fundamental to life. The third chapter is devoted to Water Clusters, examining the structure, properties and formation of

clusters. Also covered here is theoretical research on the interaction of water clusters with ozone, the impact of temperature on water clusters and more. Chapter Four is devoted to drinking water and factors

affecting its quality. Discussion includes ecological and hygienic classification of centralized drinking water supply sources, water quality requirements, and problems and potentialities of drinking water preparation. The

author introduces a new concept for supplying the population with high-quality drinking water. The fifth chapter examines the peculiarities and problems of water decontamination, with sections on chlorination,

ozonation, the bactericidal effects of ultrasound and ultraviolet rays and more. Chapter Six offers a thorough exploration of the theory, means and methods of bio testing as an evaluation method for the quality of drinking water.

The final chapter discusses new state standards for drinking water, as well as requirements and methods of quality control. The concluding selection relates the urgent need to measure, evaluate and protect the quality of

drinking water and describes a new state standard of drinking water quality.
An essential resource for scientists designing new energymaterials for the vast landscape of solar energy

conversion as wellas materials processing and characterization Based on the new and fundamental research on novel energymaterials with tailor-made photonic properties, the role ofmaterials engineering has been

to provide much needed support inthe development of photovoltaic devices. Advanced EnergyMaterials offers a unique, state-of-the-art look at the newworld of novel energy materials science, shedding light

on thesubject's vast multi-disciplinary approach The book focuses particularly on photovoltaics, efficient lightsources, fuel cells, energy-saving technologies, energy storagetechnologies,

nanostructured materials as well as innovatingmaterials and techniques for future nanoscale electronics. Pathwaysto future development are also discussed. Critical, cutting-edge subjects are addressed, including: Non-

imaging focusing heliostat; state-of-the-art ofnanostructures Metal oxide semiconductors and their nanocomposites Superionic solids; polymer nanocomposites; solid electrolytes;advanced electronics Electronic and optical properties

of lead sulfide High-electron mobility transistors and light-emittingdiodes Anti-ferroelectric liquid crystals; PEEK membrane for fuelcells Advanced phosphors for energy-efficient lighting Molecular computation

photovoltaics and photocatalysts Photovoltaic device technology and non-conventional energyapplications Readership The book is written for a large and broad readership includingresearchers and

university graduate students from diversebackgrounds such as chemistry, materials science, physics, andengineering working in the fields of nanotechnology, photovoltaicdevice technology, and non-conventional energy.

New Horizons in Photocatalysis
Processing Techniques and Applications
From Basic Science to Applications
Emerging Trends in TiO2 Photocatalysis and

ApplicationsMDPI Volume is indexed by Thomson Reuters BCI (WoS). The goal of this special volume was to provide a unique opportunity to exchange information, to present the latest results and

to review relevant issues affecting contemporary diffusion research. The large number (over 232) of peer-reviewed papers emphasizes the considerable academic and industrial interest in this field.